

**GE 348**

**Engineering Economics**

**Midterm Examination**

**March 1, 2000**

*50 minutes allowed for completion*

**Open Textbook & 1 Double-sided cheat sheet ONLY**

Do all work neatly (design note format) on the exam paper.  
**CASH FLOW DIAGRAMS ARE REQUIRED FOR EACH QUESTION**  
List answers in the box(es) corresponding to each question.

**SIGN EACH EXAM PAGE OF THE EXAMINATION**

<b>Question</b>	<b>Marks Obtained</b>
1. /20	
2. /20	
3. /15	
4. /15	
5. /20	
Total /90	

**NAME:** \_\_\_\_\_

**STUDENT #:** \_\_\_\_\_

Name: \_\_\_\_\_

**20 Marks**

1. You are considering the purchase of a new home. The price of the home is \$180,000. To pay for home, you will first require a down-payment of 5 % of the purchase price. To come up with the down-payment, you remove the requisite amount from an investment account you hold (an account that pays 6 % compounded monthly). The remaining balance will be obtained through a mortgage from the bank, at a negotiated rate of 7 % compounded annually.
  - a) Assuming you have 20 years to pay-off the loan, what monthly mortgage payments will you incur?
  - b) Over the 20 year mortgage period, what is the total equivalent uniform monthly cost of the house purchase?
  - c) Suppose you renegotiate your mortgage rate at the end of year 10. Given a new rate of 6 % compounded annually, what monthly mortgage payments will be required to pay-off the remaining balance of the loan by the end of year 20?

(a)

(b)

(c)

**20 Marks**

2. Cars-2-Rent Inc. is considering the purchase of 10 additional automobiles for their rental fleet. To smooth their cash flows, Cars-2-Rent negotiates a unique purchasing agreement with a local car dealership (Marlin Motors). Cars-2-Rent will pay half of the agreed total cost up-front. Then, beginning at the end of the first year, Cars-2-Rent will pay Marlin Motors \$4,000 per quarter—increasing by 5% per quarter—over a period of 3 years. At the end of the 4 years, Cars-2-Rent will return the vehicles to Marlin Motors. Marlin Motors, in turn, will sell each car for about \$6,500.
- a) Given that both companies have a MARR of 12 %, what will Cars-2-Rent pay up-front for all ten automobiles?
- b) Suppose Cars-2-Rent negotiated a deal whereby the quarterly payment—again beginning at the end of the first year—is set at a uniform amount of \$6,000. Would they end up paying less overall? What is the up-front cost in this case? Again, assume MARR is 12 %.

(a)  
Up-front =

(b)  
Yes or No?

Up-front =

Name: \_\_\_\_\_

**15 Marks**

3. An environmental engineering firm has developed a new method of covering waste rock piles at mine sites. If approved by regulators, this method will reduce the costs associated with gold mining, in particular. You are an engineer working with a major mining company considering the merits of an open pit gold mine in east Australia. If your company—along with other mining companies around the world—chooses to adopt this new technology, will it:

- a) drive the world price of gold up or down?
- b) cause an increase or decrease in the quantity of gold demanded world-wide?

Illustrate these changes using demand and supply curves for gold.

(a)

(b)

Name: \_\_\_\_\_

**15 Marks**

4. Metallica Inc., a local steel fabricator, is debating the merits of purchasing a computerized plasma cutter. The purchase price of the machine is approximately \$215,000. Annual operating and maintenance costs are estimated at about \$75,000 (including an experienced operator). At the end of every third year, additional refurbishing costs of about \$60,000 will be required. Additional annual revenues attributable to the machine will be about \$100,000 in the first year, increasing by approximately \$10,000 per year thereafter. At the end of 8 years of operation, Metallica figures they can sell the machine for about \$50,000.
- a) Given a MARR of 10%, should Metallica buy this machine? Use the ERR measure of merit.

(a)  
Yes or No?

ERR =

Name: \_\_\_\_\_

**20 Marks**

5. Have-Plane-Will-Travel Airlines Inc. is considering the purchase of a used Fokker F28. The purchase price is \$3.4 million. Annual operating and maintenance costs will amount to approximately \$1.6 million. If purchased, however, the company figures it can earn an additional \$2.5 million dollars in annual revenues. To go through with the purchase, however, the investment will have to yield a Discounted Payback of 6 years or less. Does the investment meet this criteria given:

a) a MARR of 8 % ?

b) a MARR of 8 % and projected revenue growth of 5 % per year?

(a)  
Yes or No?

DPBP =  
(if  $\leq 6$ )

(b)  
Yes or No?

DPBP =  
(if  $\leq 6$ )